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MAR 15 1996

March 15, 1996

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W. Room 222
Washington, D.C. 20554

Re: Ex Parte CC Docket 94-1

Dear M. Caton:

On Thursday, March 14, 1996, Dr. J.R. Norsworthy and Dr. E.R. Berndt, consultants for AT&T, and B. Cox, A. Dipierro, P. Malandrakis of AT&T, and I met, with A. Belifante, A. Bush, R. Kannen, L. Selzter, S. Spaeth, of the Common Carrier Bureau and discussed the attached material in the above referenced Docket.

Because the meeting concluded late in the day, two(2) copies of this notice are being submitted to the Secretary of the FCC today in accordance with Section 1.1206(a)(2) of the Commission's rules,

Sincerely yours,

Brian W. Masterson

Attachment

cc: A. Belifante
A. Bush
R. Kannen
S. Spaeth
L. Seltzer

No. of Copies rec'd 0+2
List ABCDE

THE PERFORMANCE BASED MODEL

CC DOCKET 94-1

MAJOR ISSUES:

- **O Input Price Differential**
- **O Measurement of TFP for Interstate Access**
- **O Comparison of TFP Measurement Methods**

THE PERFORMANCE BASED MODEL
THE PCI AND THE X FACTOR

$$\Delta PCI = \Delta GDPPI - X$$

$$\Delta PCI = \Delta GDPPI - (\Delta TFP_{LECs} - \Delta TFP_{NFB}) - (\Delta IP_{NFB} - \Delta IP_{LECs})$$

ISSUES: ⇑ **HOW TO MEASURE** ⇑ **HOW TO MEASURE**

PERFORMANCE BASED MODEL (PBM)
AND SIMPLIFIED CHRISTENSEN MODEL (SCM)

ECONOMIC PRINCIPLES UNDERLYING TFP MODELS

Simplified Christensen Model	Performance Based Model
Assumed Return on Capital	Actual Return on Capital
Assumed Overall Cost Minimization: Requires Instantaneous Adjustment of Inputs	Short Term Variable Cost Minimization: Allows Lagged Adjustment of Inputs
Assumed Competition in Output Market To Enforce Cost Minimization	No Market Structure Assumption

THE PERFORMANCE BASED MODEL
BASIC PRINCIPLE IN TFP MEASUREMENT: TOTAL COST = TOTAL REVENUE

TC = TR IS TRUE FOR PBM, SO THAT:
FOR GIVEN INPUT EXPENSES, CHANGES IN TFP
DUE TO MODIFICATIONS IN PRICE OR QUANTITY INDEX
ARE OFFSET BY CHANGES IN IPD

TC = TR IS *NOT* TRUE FOR SCM, SO THAT:
FOR CAPITAL EXPENSES, CHANGES IN TFP
DUE TO MODIFICATIONS IN PRICE OR QUANTITY INDEX
ARE *NOT* OFFSET BY CHANGES IN IPD

THIS HAPPENS BECAUSE COST ASSIGNED TO CAPITAL
IN SCM IS NOT EXPENSE CHARGED TO CUSTOMERS OF THE LECs
IN SCM, TC DOES NOT EQUAL TR. TR IS TYPICALLY GREATER.

THE PERFORMANCE BASED MODEL
ILLUSTRATION OF COMPENSATING CHANGES IN TFP (Q) AND IPD (P)

EXPENSE	PRICE	QUANTITY	NEW PRICE ⇒	NEW QUANTITY	
25	1.00	25	1.00	25	THUS ΔTFP ⇓
45	1.50	30	1.00	45	ΔIP ⇑

INPUT PRICE DIFFERENTIAL (IPD)

THE CENTRAL ISSUE: HOW LARGE IS THE IPD?

- **o USTA's FIRST WRONG ASSUMPTION:**

  The LEC Input Price Movements Are the Same As National Input Prices
  [Both as Determined by Christensen Asso., Not by Bureau of Labor Statistics]

  Further Note: Time Period Extends 25 Years before Divestiture

  - **o A TEST OF THE ASSUMPTION** (Still Not Central):

    Opposite to USTA: The LEC Input Prices Are Not the Same as
    National Input Prices: Test Is Not Rejected

- **o USTA's SECOND WRONG ASSUMPTION:** THE POST-DIVESTITURE RISE IN THE IPD ABERRATIONAL

  The LEC *Input* Prices Are Appropriately Modeled Based on National *Output* Prices (Materials) and an Untraceable Moody Public Utility Bond Rate, Plus Assorted Dummy Variables

  - **A TEST OF THE MODEL SUPPOSEDLY VALIDATING THE ASSUMPTION** (Still Not Central):
    Fuss equations are marred by time series problems: variables are not cointegrated.

Note that BOTH of these questions are off the direct point: How large is the IPD?

HOW TO MEASURE THE IPD
COMPARISON OF INPUT PRICE MEASURES, PBM AND SCM

INPUT	Performance Based Model	Simplified Christensen Model	Remarks
Capital	Unit Cost of Real Capital Input Based on Cost of Capital Levied on LECs' Customers. Employs standard convention of using sector-specific rates of return.	Implied Cost of Real Capital Input Based on National Income Accounts, *NOT* Related to LECs' Capital Cost.	SCM contradicts Jorgenson, BLS practices of using sector-specific measures of rate of return.
Labor	Total Compensation per Employee	Total Compensation per Employee	None.
Materials (Includes Purchased Services)	Index of Prices Paid for *Inputs* by Telecommunications Industry, per BLS Input-Output Study.	GDPPI, an *Output* Price.	SCM practice reduces *measured* IPD. BLS, Jorgenson use sector-specific materials deflators.

INPUT	Performance Based Model	Simplified Christensen Model	Remarks
National Input Prices	Input Prices for Private NonFarm Business Sector	1984-1993: Input Prices for Private Business Sector (includes Volatile Farm Sector) **1949-1983: Undocumented. Methods not publicly available.**	Earlier Data Relate To Historical Statistical Analysis of IPD.

HOW LARGE IS THE IPD?

PERFORMANCE BASED MODEL	SIMPLIFIED CHRISTENSEN MODEL: USTA BYPASS #1	SIMPLIFIED CHRISTENSEN MODEL: IMPLIED
2.8%	0%	2.6%

INTERSTATE TFP MEASUREMENT

THE DECISION: TO MEASURE OR NOT TO MEASURE

FACT: INTERSTATE ACCESS SERVICES GROW FASTER THAN OTHER LEC SERVICES. EMPIRICAL EVIDENCE OF ECONOMIES OF DENSITY IS STRONG.

FACT: MARGINAL COST OF PROVIDING INTERSTATE ACCESS SERVICES, WHILE NOT MEASURED DIRECTLY, *IS* KNOWN TO BE QUITE LOW.

ISSUE: What should be done when the requirements of theory for a precise estimate of Interstate Access TFP growth cannot be tested?

Solution 1. Assume it is the same as total (*regulated!*) company TFP growth, (i.e. ignore the facts, deny that there is an issue.) ***THIS IS USTA BYPASS #2.***

If Solution 1. is adopted, we will get the wrong answer. The Interstate Access charges will be almost **$4B too high** over the next four years. These charges will be – and under the competitive conditions in the long distance market must be – passed to ratepayers in the long run). The excess is a windfall to RBOCs. (NYNEX and Ameritech

Solution 2. Use engineering and economic information to obtain a range or conservative bound for Interstate Access TFP growth.

If Solution 2. is adopted, the derived question is: can we estimate a reasonable upper bound for growth of *Inputs* for interstate access, since output growth is not an issue.

BACKGROUND FOR INTERSTATE TFP:
ECONOMIES OF DENSITY AND ECONOMIES OF SCALE

COST ELASTICITY OF TRAFFIC DENSITY: RESPONSE OF COST TO INCREASE OF TRAFFIC ON A GIVEN NETWORK. IF INPUT COST INCREASES LESS THAN PROPORTIONATELY, THIS IMPLIES ***ECONOMIES OF DENSITY.*** SPECIFICALLY, IF OUTPUT GROWS FASTER THAN INPUTS AS TRAFFIC DENSITY INCREASES, ECONOMIES OF DENSITY ARE PRESENT.

COST ELASTICITY OF NETWORK SIZE: RESPONSE OF COST TO INCREASE OF SIZE OF NETWORK (ACCESS LINES), HOLDING TRAFFIC CONSTANT. IF INPUT COST INCREASES LESS THAN PROPORTIONATELY, THIS IMPLIES ***ECONOMIES OF SIZE.***

COST ELASTICITY OF OUTPUT: RESPONSE OF COST TO INCREASE OF TRAFFIC AND NETWORK TOGETHER AT SAME RATE. IF INPUT COST INCREASES LESS THAN PROPORTIONATELY, THIS IMPLIES ***ECONOMIES OF SCALE.***

THUS **ECONOMIES OF SCALE** HAS TWO COMPONENTS: **ECONOMIES OF DENSITY** AND **ECONOMIES OF SIZE.**

EMPIRICAL EVIDENCE ON ECONOMIES OF DENSITY FOR LOCAL EXCHANGE CARRIERS

FOR WHOLE BELL SYSTEM:

L. Christensen, D. Christensen and Schoech (1983) find economies of density.

Nadiri and Shankerman (1981) find economies of density.

FOR LOCAL EXCHANGE CARRIERS:

Shin and Ying (1992, 1993) find economies of density: 58 LECs, 1976-1983;
46 LECs, 1976-87.

Norsworthy, Jang, MacDonald, Tsai, Fu and Jing (1993) find economies of density: 11 large LECs/RBOCs, 1981-1990.

Bellcore (1987) finds economies of density: RBOCs, 1972-1982 (according to Christensen: testimony for Pacific Bell at California PUC.)

*THUS FROM THE **ECONOMETRIC EVIDENCE**, ECONOMIES OF DENSITY CHARACTERIZE THE GROWTH OF TRAFFIC ON THE LOCAL TELEPHONE NETWORK.* THESE STUDIES ALSO FIND MINIMAL ECONOMIES OF SCALE (Economies of size negative).

INTERSTATE TFP MEASUREMENT

SOME OBJECTIONS

OBJECTION	REMARKS
1. No economically meaningful measure of TFP for interstate access can be constructed because costs are not reported separately and cannot be separated. (Practical version -- Christensen)	At present, the RBOCs file data annually for their regulated business. Increasingly, **unregulated business grows relative to regulated business**. Rules for separating regulated and unregulated costs are the basis for ARMIS and other reports, the basis for the TFP in both the PBM and SCM.

INTERSTATE TFP MEASUREMENT

SOME OBJECTIONS

2. Jurisdictional separations are not meaningful for estimating Interstate TFP.	**Current rates are based on inherited starting points from jurisdictional separations** in rate of return era. That is, the rates that have been capped began at the rates from the RoR era. The new rates were not determined *de novo* in the price cap era. **The LECs did not reject initially the rates based on jurisdictional separations.** FCC's objective to set X that allows recovery of interstate costs: necessarily implied separations.

INTERSTATE TFP MEASUREMENT

SOME OBJECTIONS

3. No economically meaningful measure of TFP for interstate access can be constructed because costs are not separable. (Mathematico-logical version -- Fuss)	The strong separability requirement for cost separability stated by Fuss is ***sufficient*** to permit estimates of both interstate and intrastate TFP. However, the condition is not necessary. Only weak cost separability, evidenced by constant economies of scope – or statistically insignificant deviations from constant economies of scope – are ***necessary***. Even if the deviation from economies of scope are statistically significant, the effect may be quantitatively too small to be important.

INTERSTATE TFP MEASUREMENT

EMPIRICAL EVIDENCE ON INTERSTATE INPUT GROWTH FOR LOCAL EXCHANGE CARRIERS

PUBLICLY AVAILABLE DATA FOR ALL TIER 1 LECs, 1989-94 SHOW THAT:

- o Interstate output grows faster than intrastate output (ARMIS).
- o Interstate revenues grow faster than interstate costs assigned by separations process, *even though* rates are falling relative to input prices.
- o Interstate costs have grown less than intrastate costs.
- o Ratio of in***ter***state revenues to in***ter***state costs grows faster than ratio of in***tra***state revenues to in***tra***state costs. (X-Factor too low.)

Then it is concluded that interstate output is produced under conditions of economies of density, and that economies of density in interstate access exceed economies of density in intrastate services.

CONSEQUENTLY, THE ECONOMETRIC EVIDENCE AND ACCOUNTING EVIDENCE AGREE THAT INTERSTATE OUTPUT GROWTH RESULTS IN ECONOMIES OF DENSITY FOR THE LECS.
Thus the assumption that interstate inputs grow at same rate as intrastate inputs is conservative in light of the accounting evidence viewed together with the econometric evidence, so that total company input growth is a reasonable upper bound for interstate input growth.

INTERSTATE TFP MEASUREMENT:

WHY THE PERFORMANCE BASED ESTIMATE IS CONSERVATIVE

O Strong Evidence of Economies of Density (Cited by Christensen When Arguing for Lower State Level X-Factor)

O Logic of Network Traffic Increase

O Evidence from Jurisdictional Cost Separations

N.B. Separations Effects Estimated, *BUT NOT APPLIED.*

Table 8. TFP, Input Price Differential and X-Factor in Interstate and All Regulated Services: Rates of Growth, 1985-1994

	Interstate Access Services	All Regulated Services
Output Growth	6.83%	4.90%
- Input Growth	2.13%	2.13%
= TFP Growth LECs	4.70%	2.77%
- TFP Growth NFB	0.15%	0.15%
= TFP Differential	**4.55%**	**2.62%**
Input Price Growth NFB	3.00%	3.00%
- Input PRICE Growth LECs	0.22%	0.22%
= IPD	**2.78%**	**2.78%**
X-Factor	**7.33%**	**5.40%**

Note: NFB is Private NonFarm Business

COMPARISON OF PERFORMANCE BASED MODEL (PBM) WITH SIMPLIFIED CHRISTENSEN MODEL (SCM)

RESULTS OF MODELS

Simplified Christensen Model		Performance Based Model	
TFP Growth Differential (Total Reg. Company)	2.8%	TFPGrowth Differential Interstate	4.6%
Input Price Differential	0%	Input Price Differential	2.8%
X-Factor	2.8%	X-Factor	7.3%

NOTE: In 1994, 5 of 7 RBOCs Chose an X-Factor of 5.3%.
The RBOCs Themselves Don't Believe the SCM Results!

COMPARISON OF PERFORMANCE BASED MODEL (PBM) WITH SIMPLIFIED CHRISTENSEN MODEL (SCM)

RECONCILIATION OF MODELS

Simplified Christensen Model		Performance Based Model	
TFP Growth Differential (Total Reg. Company)	2.8%	TFP Growth Differential Interstate	4.6%
Add: Input Price Differential	2.8%	Input Price Differential	2.8%
Add: Interstate Differential	1.9%		
Adjusted SCM X-Factor	7.4%	PBM X-Factor	7.3%

The SCM Measure of TFP Actually Implies a Slightly Higher X-Factor Than the PBM

Comparison of TFP Methods in Performance Based Model and USTA's Simplified Christensen Model with BLS TFP Methods.

Performance-Based Model: RBOC TFP	Bureau of Labor Statistics Division of Productivity Research: Sectoral TFP	Simplified Christensen Model: RBOC & Other LECs' TFP
Aggregation of Outputs and Inputs by Fisher Ideal Index (FII).	Aggregation of Outputs and Inputs by Tornquist Index. Changing to Fisher Ideal Index. (FII already used in Major Sectors, e.g. private nonfarm business.)	Aggregation of Outputs and Inputs by Tornquist Index.
Service price of capital and rate of return based on actual revenues of the RBOCs.	Service price of capital and rate of return based on actual revenues in measured sector.	Service price of capital and rate of return based on external sector: Total Private Economy.
Computation of Capital Input by Perpetual Inventory Method Weighted by Service Price of Capital.	Same as PBM.	Same as PBM.
Depreciation of Capital Input by Geometric Decay. (Jorgenson and general practice.)	Depreciation of Capital Input by Hyperbolic Decay. (Idiosyncratic.)	Same as PBM.

COMPARISON OF PBM AND SCM

WHY USE THE FISHER IDEAL INDEX?
FOR THE FUTURE.

New Products

Zero in Year 1, Non-Zero Thereafter: e.g. Video Dial Tone Service
FII Is Defined, Can Calculate; Tornquist Index Not Defined

Declining Products

Quantity Near Zero
FII Well-Behaved, Tornquist III-Behaved

Large Price Changes
FII Well-Behaved, Tornquist III-Behaved

Authorities: Diewert, BLS

COMPARISON OF PBM AND SCM

THE PERFORMANCE BASED MODEL IS NOT A RATE OF RETURN MODEL IN DISGUISE

FACT: The PBM *Measures* the Rate of Return Based on the Actual Performance of the RBOCs.

FACT: The SCM *Assumes* the Rate of Return Based on THE Performance of the National Economy, *Ignores* Actual Economic Performance of the RBOCs.

SO: *WHO* Is the Rate of Return Advocate?

Table 5. Characteristics of Performance Based Model and USTA's Initial and Simplified Christensen Models. (AT&T's Reply Comments, Appendix B)

Performance-Based Model	Initial Christensen Model (ICM)	Simplified Christensen Model
1. All costs are based on actual historical performance of the LEC.	1. Capital costs are assumed and do not reflect actual costs paid by customers of the LECs.	1. Same as ICM.
2. Relies exclusively on publicly available data and fully documented methodology.	2. Uses some proprietary data not publicly available; procedures are not fully described.	*2. Uses publicly available data; procedures are not fully described.*
3. Directly measures the input price differential.	3. Assumes that input price differential is zero.	3. Same as ICM.